Title	<Part II Rural Institutions post Green Revolution> An Economic Analysis of Rural Informal Credit Market with Reciprocity
Author(s)	Fukui, Seiichi; Hara, Yonosuke
Citation	重点領域研究総合的地域研究成果報告書シリーズ : 総合的地域研究の手法確立 : 世界と地域の共存のパラダイムを求めて (1996), 25: 160-173
Issue Date	1996-11-30
URL	http://hdl.handle.net/2433/187628
Right	
Type	Journal Article
Textversion	publisher

6.

An Economic Analysis of Rural Informal Credit Market with Reciprocity

Seiichi Fukui and Yonosuke Hara

1. Introduction

In developing countries, high interest rates and credit rationing are characteristic of rural credit markets. Although the governments have been trying to supply cheap credit to farmers through the various financial systems to resolve such problems, formal credit has not contributed to mitigating high interest rates and credit rationing in the informal credit market (Von Pischke et al, 1983). One explanation for the failure is that the market interventions are based on an inadequate understanding of how rural credit markets work.

But in the past decade there have been major advances in theoretical understanding of credit markets. These advances have evolved from a paradigm that emphasizes the problem of imperfect information and imperfect enforcement (Bell 1988, Braverman and Guash 1991, Hoff and Stiglitz 1990).

According to Hoff and Stiglitz (1990), these new views of rural credit markets are based on the following observations.

1. Borrowers differ in the likelihood that they will default, and it is costly to determine the extent of that risk for each borrower. This is conventionally known as the screening problem.

2. It is costly to ensure that borrowers take action which make repayment most likely. This is the incentives problem.

3. It is difficult to compel repayment. This is the enforcement problem.

They distinguish two types of mechanisms for solving these problems; indirect and direct.

Indirect mechanisms are contracts in which the borrowers are induced to take action reducing likelihood of default and repay the loan whenever they have the resources to do so, in their own best interests. When qualities of borrowers are unknown to lenders, lenders may make a contract to reveal the borrowers qualities. One of these contracts is the one with the screening and/or incentive mechanism. Stiglitz and Weiss [1981] proved multiple interest rates equilibrium may exist in such a case. Another case is the implicit contract where if the borrower defaults on loans, the lender cuts off credit, the defaulting tarnishes their reputation (Stiglitz and Weiss, 1983).

In addition to indirect mechanisms, the lender may use the direct screening mechanisms

and/or may monitor the borrowers' behavior.

In developing countries, we can observe the institutional arrangements which lower the costs for screening or monitoring. In Nigeria, credit markets are almost completely segmented along geographic lines and kinship groups, and information asymmetries between lender and borrower within these markets appear to be negligible (Udry, 1990). Besides geography and kinship groups, linking a loan with transaction in the product market, rental markets or labor market, may alleviate screening, incentive, and enforcement problems (Bardhan, 1980, Braverman and Stiglitz, 1982, Siamwalla and others, 1990, Floro and Yotopolos, forthcoming). Furthermore, three devices; collateral requirements usufruct loans, rotating savings and credit associations are commonly used to limit the results of information asymmetries and enforcement problems (Siamwalla and others, Izumida, 1992).

In our study area, the above mentioned direct mechanisms are not common1. But, while high interest rates charged by moneylenders exist, much lower interest rates were found to be agreed upon through personal relation between lender and borrower. In the latter cases, interest rates were highly variable across individual cases (Table II).

Although the screening model by Stiglitz and Weiss can explain the variability of interest rates, it does not explore the relation between interest rate and personal relation. It is not clear how the threat of cutting off credit is related to the variability of interest rates. It may be helpful to explain the role of personal relations in determining the interest rate.

The objectives of this paper are to investigate why credit contracts with low interest rates and personal relations are so common, and to show how personal relation is an important determinant of interest rate in the informal credit market.

We postulate that this type of credit contract exists because the lender induces the borrower to avoid defaulting by promising to provide cheaper credit through a reciprocal personal relation.

To elucidate this, first we will present a theoretical model to prove that the above mentioned reciprocal credit contract can be optimal and sustained as a non-cooperative equilibrium in a repeated game (Radner, 1981, de Janvry et al, 1990). Second, based on a Philippine case study, we will present an empirical Tobit type of model showing that personal relations are an important determinant of interest rate, assets and income in the informal credit market.

2. A Theoretical Model of Reciprocal Informal Credit Contract

In this section, we present a theoretical explanation for the existence of reciprocal credit contracts, characteristic of credit market in the study area.

For this purpose, we assume a one-period principal agency framework in which a lender

maximizes his expected income according to the terms of the contract which are subject to the borrower's (farmer's) reservation utility and work efforts.

In this framework, the contract is defined by principal B and interest rate R. We assume if the borrower's income is not below the principal and the interest, he will repay them; Otherwise, he will have to pay all his income. The output depends on the land and the borrower's work effort (A). We assume that the production risk and the asymmetric information about this does not exist, so that we can ignore the screening function of interest rates. We also assume that factor marks do not exist and that the commodity market is competitive.

a) The case where the contract is enforceable

If $f(A; T)$ is the amount of production at harvest, the borrower's income (X) is;

i) if $f(A; T) - (1 + R) B + \bar{I} > 0$, $X = f(A; T) - (1 + R) B + \bar{I}$

ii) if $f(A; T) - (1 + R) B + \bar{I} < 0$, $X = 0$.

Here, f(·) is the well-behaved production function and input of land is assumed to be constant. $\bar{I}$ indicates non-labor income such as remittance, saving, gift etc. and is constant.

Taking into account the disutility of work, the borrower's problem is to choose an A that maximizes his utility,

$W = U(X, A; Ch)$. Here Ch indicates family characteristics:

$\bar{W} > U(0, A; Ch)$. The lender's optimal behavior is formulated as follows:

$$\underset{R}{Max} \quad D = \{R\, B\} \tag{1}$$

$$\text{s.t.} \quad W(R, T, I, Ch, B) \geq W \tag{2}$$

$$\text{s.t.} \quad X = f(A; T) - (1 + R) B + \bar{I},$$
$$\text{if } f - (1 + R) B + \bar{I} > 0$$
$$= 0$$
$$\text{if } f - (1 + R) + \bar{I} < 0 \tag{3}$$

In Fig. 1, we illustrate an equilibrium point $(\bar{A}; \bar{R})$ in this case. The utilities for the lender and the borrower are (D, W) respectively.

b) The case where the contract is unenforceable

If the borrower defaults ex post, we will execute an announced work effort, and the lender's income will be zero ($= D'$). The borrower's utility W' is larger than $\bar{W}$. Here $X = f(A; T) + \bar{I}$. In this case, the lender has no incentive to make a contract.

Therefore, we assume the lender can enforce the contract (A^*, R^*) by the spending enforcement cost EC (> 0). He can obtain the income $\bar{R}\,B - EC$ ($= D^*$). Here, $R^* = \bar{R}$, $A^* = \bar{A}$. The borrower's utility W^* is lower than W'.

Next, we will extend this model to a multi-period model. The sequential decision-making process considered here is dictated by the intertemporal production process. The lender announces his strategy (if the borrower abides by the contract ($\hat{A}$), the lender will provide him with a cheaper interest rate ($\hat{R}$), the borrower chooses his action ($\hat{A}$), the lender acts upon his announcement. After that, this process will be repeated. If the lender announces ($\hat{A}$, $\hat{R}$), and it is executed, the utilities for the lender and the borrower will be ($\hat{D}$, $\hat{W}$) respectively.

Here, $\hat{D} = \hat{R}\,B > R^* - EC$, $W' > \hat{W} > W^*$.

Now, we proceed to establish the conditions insuring that the reciprocal contract will be the equilibrium strategy. For this, we establish conditions under which there exist values of G (reward if the borrower abides by the contract) for which the reciprocal contract (^) is acceptable until the period preceding any predeterminance from t^*.

The trigger strategy is composed of a reference strategy and of a retaliation procedure in case of default by the other partner (Table III).

(i) Reference strategy. Each partner conforms to the contract ($\hat{A}$; $\hat{R}$) if the other doses. It switches to the noncooperative Nash equilibrium (A^*; R^*) at $t = t^*$ if the other agent switches to the Nash equilibrium at t^*, based on agreement on t^*.

(ii) Retaliation procedure. If one of the partners defaults at $t^0 \leq t^*$, the other will switch to the noncooperative Nash strategy at $t^0 + 1$.

(ii.1) If the borrower defaults, he does so by working the quantity $\hat{A}'$ at t^0 that maximizes his utility in the contract ($\hat{A}'$; R), i.e.,

$$\underset{A}{Max}\ \ EU[f(A; T) + \bar{I}, A]$$

which yields $\hat{W}' > \hat{W}$ for him but $\hat{D}' < \hat{D}$ for the lender.

(ii. 2) If the lender does not honor the contract ($\hat{A}$, $\hat{R}$) at t^0, the contract becomes, for that period, identical to the contract ($\hat{A}$, $\bar{R}$) which yields D'' ($= \bar{R}\,B$) and W'' ($< W^*$).

To establish the equilibrium strategy in this reciprocal contract, we consider a infinite T-period sequence of contracts. Clearly, if the trigger strategy is effective and the reference game prevails, the optimal strategy is to set $t^* = T$. We now need to determine under which conditions the trigger strategy is effective in deterring both partners from defaulting. This is done by considering the successive payoffs that the borrower and the lender could derive from defaulting.

b) The Equilibrium Contract for $t < T$

(i) Payoffs from the borrower defaulting. The lender will clearly lose from any the borrower defaulting. For the borrower, the value of the payoffs from alternative strategies are:

Reference strategy:

$$\sum_{t=0}^{t} \alpha^t \hat{W} + \sum_{t+1}^{T} \alpha^t W^*.$$

Borrower defaults at t^0:

$$\sum_{t=0}^{t-1} \alpha^t \hat{W} + \alpha^{t^0} \hat{W}' + \sum_{t+1}^{T} \alpha^t W^*.$$

where there is the borrower's discount factor.

From this, we see that the net gain from defaulting at $t^0 = t^*$ is

$$W = \alpha^{t^0}(\hat{W}' - \hat{W}) > 0.$$

The net gain from defaulting at $t^0 < t^*$ is

$$W = \alpha^{t^0}(\hat{W}' - \hat{W}) - \sum_{t+1}\alpha^t (\hat{W}' - W^*)$$

$$= \alpha^{t^0}[(\hat{W}' - \hat{W}) - (\hat{W} - W^*)\cdot\alpha \cdot \frac{1-\alpha^{t^*-t^0}}{1-\alpha}]$$

The borrower will default before t^* if this net gain from defaulting is positive, i.e., if

$$\frac{\hat{W}' - \hat{W}}{\hat{W} - W^*} > \alpha \cdot \frac{1-\alpha^{t^*-t^0}}{1-\alpha}$$

By differentiating $(\hat{W}' - \hat{W}) / (\hat{W} - W^*)$ with respect to $G(= R\,B - \hat{R}B)$, one can show that it is a decreasing function $f(G)$ of G

$$R_T(\hat{X} - \hat{X}') < \frac{\hat{W}' - \hat{W}}{\hat{W} - \hat{W}^*} = f(G),$$

where $R_T = U'' / U'$ is the degree of risk aversion for the borrower. This condition is more likely to hold the lower the degree R^T of risk aversion for the borrower. In this case,

$$\text{if } f(G) > \frac{\alpha}{1-\alpha}, \text{i.e., } G < f^{-1}(\frac{\alpha}{1-\alpha}), \text{ the borrower defaults at } t^0 = 0;$$

if $\alpha < f(G) < \frac{\alpha}{1-\alpha}$, i.e., $f^{-1}(\frac{\alpha}{1-\alpha}) < G < f^{-1}(\alpha)$, the borrower defaults at

$$t^0 = t^* - \frac{\ln[1 - f(G)\frac{1-\alpha}{\alpha}]}{\ln \alpha};$$

if $f(G) \leq \alpha$, i.e. $G > f^{-1}(\alpha)$, the borrower will not default. This last condition establishes the minimum gift $f^{-1}(\alpha)$ that the lender needs to give to prevent the borrower from defaulting at $t^0 < t^*$. This minimum G is a decreasing function of α and an increasing function of the utility of leisure.

(ii) Payoffs from defaulting by the lender. If it is the lender who defaults on the gift at $t^0 < t^*$, the borrower always loses by the amount

$$\sum_{t=t}^{t^*} \alpha^t (W'' - \hat{W}) < 0.$$

For the lender, the present value of the payoffs from alternative strategies are

Reference strategy:

$$\sum_{t=0}^{t^*} \beta^t \hat{D} + \sum_{t+1}^{T} \beta^t D^*.$$

Lender defaults at t^0:

$$\sum_{t=0}^{t^0-1} \beta^t \hat{D} + \beta^{t^0} D'' + \sum_{t+1}^{T} \beta^t D^*,$$

where is the lender's discount factor.

The net gain from defaulting at $t^0 = t^*$ is

$$\Delta Z = \beta^{t^0}(D'' - \hat{D}) > 0.$$

The net gain from defaulting at $t^0 < t^*$ is

$$\Delta Z = \beta^{t^0}[(Z'' - Z) - (Z - Z^*)\cdot\beta\cdot \frac{1 - \beta^{t^*-t^0}}{1-\beta}],$$

where $D'' - \hat{D} = G$ and $\hat{D} - D^* = \hat{D} - D^* - G$. Default will, consequently, occur when

$$\frac{G}{\bar{D} - D^* - G} \geq \beta \cdot \frac{1 - B^{t^*-t0}}{1 - \beta}$$

There consequently, exists a $t^0 \leq t^* - 1$ at which the lender has advantage to default if

$$G \geq (\bar{D} - D^*) \frac{\beta}{1 + \beta}$$

This establishes the maximum G that the lender can give without having an incentive to default at $t^0 < t^*$.

In conclusion, the equilibrium conditions for the contract before time t^* are:

(i) The borrower will only accept the reference contract if the lender has no incentive to default, i.e., if

$$G < (\bar{D} - D^*) \frac{\beta}{1 + \beta}$$

(ii) The lender will only accept the reference contract if the borrower has no incentive to default, i.e., if $G > f^{-1}(\alpha)$. An efficient, cooperative-equivalent contract will only be feasible if

$$f^{-1}(\alpha) < (\bar{D} - D^*) \frac{\beta}{1 - \beta} .$$

If and only if this condition is established, both the lender and the borrower will have no incentive to default at $t^0 < t^*$. The trigger strategy will be effective in ensuring $(\hat{A}, \hat{R})$ as the equilibrium contract.

In addition, it can be easily shown that the more the lender attaches importance to the borrower's welfare, the higher G he offers.

3. The Empirical Evidence

In the previous section, we showed that in a reciprocal credit contract through personal relations, the interest rates can be lower than those offered by money lender. The amount varies for each individuals.

Next, we presented empirical evidence to support the theoretical explanation of the facts.

Following equations (1), (2) and (3), an actual interest rate R^i_m for each household $i = 1, ..., n$, can be shown as a function of family asset T (planted area of paddy, Animals Owned, Machines Owned), non-labor income I (Debt from formal sector, Remittance, Off-farm labor income), family characteristics Ch (Education, Family labor ratio), the amount of Debt B

(Debt from informal sector), opportunity income W and the personal relation between the lender and the borrower Re;

$$R^{i}_{m} = R^{i}_{m}(T, \bar{I}, Ch, B, W, Re)$$

In order to estimate the determinants of interest rates in the informal credit market, the following standard Tobit econometric model of interest rates is assumed:

$$R_M = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 Z_1 + \beta_8 Z_2 + \beta_9 Z_3 + u$$

Rm is an actual interest rate, β's are parametric and the u is independent. Normally distributed error processes have zero mean and constant variance. As for Z's and X's, the definitions are listed in Table II.

$$\text{If } R^{i}_{m} \geq 0,\ R^{i}_{m} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 Z_1 + \beta_8 Z_2 + \beta_9 Z_3 + u$$

otherwise, $Rm = 0$.

The results of the estimate are given in Table IV. The parameters of the personal relation dummy, the amount of formal credit, planted area of paddy, animal, machine and income, are negative. In village T, the formal credit or planted area, and machine significantly affect the interest rate, but not in village D. The personal relation negatively and significantly affects the interest rate in both villages [2]. This proves the personal relation to be a common determinant of interest rate in the informal credit market.

Why do family asset such as land and fixed capital determine the interest rate? It is reasonable to assume that larger family assets negatively affect production risk. The less risky the agricultural production, the lower the interest rate is, as shown in Stiglitz and Weiss [1981].

As for the amount of debt, the parameters are significant. Results show that the more the borrower gets a loan, the higher interest rate he will have to pay.

4. Conclusion

The results of our analysis indicate that if the borrower has the reciprocal personal relationship with the lender and has larger assets, he has access to cheaper credit. On the other hand, if the borrower does not have a personal or social connection and smaller assets,

he is ineligible for cheaper credit.

Presently the governments in most developing countries are trying to introduce market mechanisms for financing agricultural credit. But such a development strategy cannot provide the rural poor with a cheaper credit. However, this can stop the official fund from going only to the wealthy farmers who have access to public channels.

This paper shows that the rural credit market is segmented, so the new rural credit system may not be as effective as expected.

Therefore, it is strongly suggested that the government apply rural development strategies which create job opportunities for rural poor and provide an alternative rural financing system which promotes the mobilization of potential savings in rural area.

Note

[1] We conducted a field study to collect the micro household data in two villages. D and T, in the Philippines. Village D is a traditional rice-growing village and has a strong 'Moral Economy' based on voluntary interpersonal transfers of money or goods. Village T is located near Metro Manila and the significance of 'Moral Economy' is weaker. For a complete description of 'Moral Economy', refer to Scott [1976] and Ravallion and Dearden [1988].

[2] One explanation of the insignificance of assets and formal credit in village D, may be that neighbourliness and reciprocity are more important in the traditional rural village, where there is still a significant presence of the 'Moral Economy'.

References

1. Bardhan, P.K. 1980. Interlocking Factor Markets and Agrarian Development: A Review of the Issues. *Oxford Economic Papers*. 32: 82-98.
2. Bell, C. 1988. "Credit Markets and Interlinked Transactions". In H.B. Chenery and T.N. Srinivasan (eds.) *Handbook of Development Economics*. North-Holland (Amsterdam).
3. Bell, C. 1990. "Interactions between Institutional and Informal Credit Agencies in Rural India", *The World Bank Economic Review*. 4: 292-327.
4. Braverman, A. and Guash, J.L. forthcoming. The Theory of Rural Credit Markets, In *Agricultural Development Policies and The Theory of Rural Organizations* ed. by A. Braverman, K. Hoff and J. Stiglitz.
5. Braverman, A. and Stiglitz, J. 1982. Sharecropping and the Interlinking of Agrarian Markets. *American Economic Review*. 72: 695-715.
6. de Janvry, A. Fukui, S. and Sadoulet, E. 1990. Efficient Share Tenancy Contracts under Risk: The Case of Three Rice-growing Villages in Thailand. D.A.R.E., University of California, Berkeley, Working Paper No. 507.

7. Floro, S.L. and Yotopoulos, Pan A. forthcoming. *Informal Credit Markets and the New Institutional Economics: Philippine Agriculture.* Westview Press (Boulder, San Francisco & Oxford).
8. Hoff, K. and Stiglitz J.E. 1990. Introduction: Imperfect Information and Rural Credit Markets — Puzzled and Policy Perspectives. *The World Bank Economic Review.* 4: 235-250.
9. Huppi, M. and Feder, G. 1990. The Role of Groups and Credit Cooperatives and Rural Lending. *The World Bank Research Observer.* 5: 187-204.
10. Izumida, Y. 1992. The Kou in Japan: A precursor of Modern Finance. In "Informal Finance in Low-Income Countries" ed. by D.W. Adams and D.A. Fitchett, Westview Press (Boulder, San Francisco & Oxford), 165-180.
11. Radner, R. 1981. Monitoring Cooperative Agreements in a Repeated Principal-Agent Relationship. *Econometrica.* 24: 549-576.
12. Ravallion, M. and Dearden, L. 1988. Social Security in a "Moral Economy": An Empirical Analysis for Java. *The Review of Economics and Statistics.* 70: 36-44.
13. Scott, J.C. 1976. *The Moral Economy of the Peasant.* Yate University Press (New Haven).
14. Siamwalla, A. Pinthong, C. Poapongsakorn, N. Satsanguan, P. Nettayarak, P. Mingmaneenakin, W. and Tubpun, Y. 1990. The Thai Rural Credit System: Public Subsidies, Private Information and Segmented Markets. *The World Bank Economic Review.* 4: 271-295.
15. Stiglitz, J. and Weiss, A. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review.* 71: 393-410.
16. Stiglitz, J. and Weiss. A. 1983. Incentive Effects of Termination: Applications to the Credit and Labor Markets. *American Economic Review.* 73: 912-927.
17. Udry, C. 1990. Credit Markets in Northern Nigeria: Credit as Insurance in Rural Economy. *The World Bank Economic Review.* 4: 251-269.
18. Udry, C. 1991. A Competitive Analysis of Rural Credit: State-Contingent Loans in Northern Nigeria. Economic Growth Center, Yale University, Center Discussion Paper No. 630.
19. Von Pischke, J.D. Adams, D.W. and Donald, G. eds. 1983. *Rural Financial Markets in Developing Countries.* Johns Hopkins University Press (Baltimore).

Figure 1. Equilibrium in the Reciprocal Credit Transaction

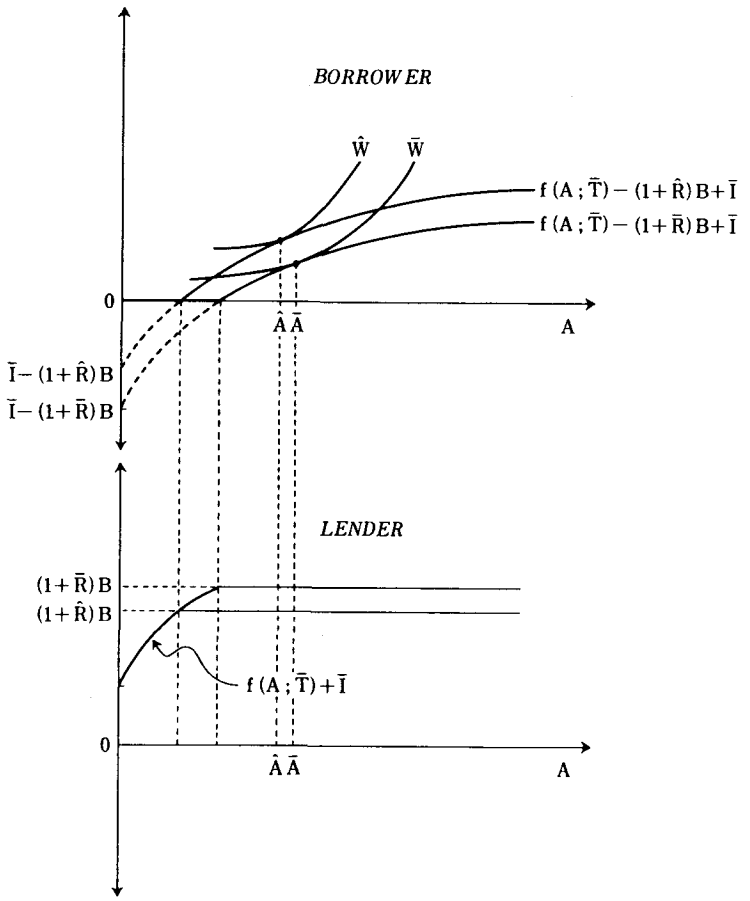

Table I-(1)

Interest Rate of Loan, by Type of Creditor (Village D)

Type of Creditor	Interest Rate (%/year)	Number of Case				
		Zero	1-18	19-50	50-100	100 above
Financial Institution						
Bank			8	2		
Cooperative			7			
Others		1	1			
Private Person						
Relative		9	1		1	7
Friend		1	2			
No-Relation		12	2	1	1	27

Table I-(2)

Interest Rate of Loan, by Type of Creditor (Village T)

Type of Creditor	Interest Rate (%/year)	Number of Case				
		Zero	1-18	19-50	50-100	100 above
Financial Institution						
Bank		1	6	1	2	
Cooperative		1	2		3	
Others		1	1	1		
Private Person						
Relative		5	1			3
Friend		4	2	4	1	2
No-Relation		16	3	1	7	27

Table II

Utility Matrix Showing the Game Strategy

Creditor's Strategy	Debtor's Strategy (1) $A\ (=A^*)$	(2) A	(3) A' (defect)
(1) Purly Economic High-interest Contract with Enforcement Cost $R^*\ (=R)$	D^*, W^*		
(2) Reciprocal Low-interest Contract without Enforcemnt Cost R		$\hat{D}, \hat{W}$	$\hat{D}', \hat{W}'$
(3) Defect R		D'', W''	

Note

(a) $D^* = \overline{D} - EC, \overline{D} = \overline{R} \cdot B$
$W^* = \overline{W} = U(X, \overline{A}; Ch), X = f(\overline{A}; T) - (1 + \overline{R}) \cdot B + \overline{I}$

(b) $\hat{D} = \hat{R} \cdot B, \hat{R} < R$
$\hat{W} = U(X, \hat{A}; Ch), X = f(\hat{A}; T) - (1 + \hat{R}) \cdot B + \overline{I}$

(c) $D' = 0$
$W' = U(X', A'; Ch), X' = f(A'; T) + \overline{I}$

(d) $D'' = \overline{R} \cdot B - EC, D'' > \hat{D}$
$W'' = U(X'', \hat{A}; Ch), X'' = f(\hat{A}; T) - (1 + \overline{R}) \cdot B + \overline{I},$
$W'' < \hat{W}$

(e) $\hat{D}' = 0, \hat{W}' = U(\hat{X}', \hat{A}; Ch), \hat{X}' = f(\hat{A}; T) + \overline{I}$

Table III

List of Variables for Tobit Analysis

Variable	Description	Unit
X1	Total School Year of Household Head	Year
X2	Ratio of Family Laborer	
X3	Log (Owned Animal)	Peso
X4	Log (Owned Machine)	Peso
X5	Planted Area for Rice Production	Ha
X6	Log (Household Income)	Peso
R_m	Interest Rate of Current Outstanding Debt from Informal Sector	
Z1	Log (Current Outstanding Debt from Private Sector)	Peso
Z2	Log (Current Outstanding Debt from Formal Sector)	Peso
Z3	If credit conact is made thorugh personal relation, = 1; Otherwise, = 0	

Table IV

Estimation Results of Informal Credit Market

Independent Variable	Dependent Variable: Y			
	Village D		Village T	
	case1	case 2	case 1	case 2
Constant	−176.97	−175.83	66.78	107.87
	(−1.82**)	(−1.82**)	(0.56)	(0.89)
Z1	51.62	50.92	29.06	29.03*
	(5.59*)	(5.74*)	(6.67*)	(6.54*)
X2	−5.11	−5.42	−2.33	3.49
	(−1.01)	(−1.08)	(−0.56E−01)	(−0.82E−01)
X3	55.60	59.48	0.76E−01	0.28E−02
	(0.67)	(0.72)	(0.25E−01)	(0.91E−03)
X4	2.82	2.32	−4.30	0.62
	(0.42)	(0.35)	(−0.66)	(0.99E−01)
X5	−67.74	−67.40	−4.69	−4.30
	(−0.16E−02)	(−0.16E−02)	(−1.94**)	(−1.72**)
X6	−2.64	−2.49	−10.02	−16.95
	(−0.49)	(−0.47)	(−1.65)	(−3.08*)
X8	−0.21	0.12	−11.18	−16.17
	(−0.23E−01)	(−0.12E−01)	(−0.87)	(−1.24)
Z2	−2.73		7.42	
	(−0.49)		(−2.37*)	
Z2	−114.27	−114.17	−70.14	−70.63
	(−3.63*)	(−3.61*)	(−3.50*)	(−3.40*)
SIGMA	93.08	93.51	72.47	75.18
	(7.17*)	(7.17*)	(11.30*)	(11.29*)
Log of Likelihood Function	−189.61	−189.73	−382.06	−384.86
No. of Observations	75		93	
No. of positive Observations	30		66	

Note: * indicates significane at 1% level:
** at 5% level; Figures in parentheses refer to *t*-statistic.